Massachusetts Division of
Health Care Finance and Policy

Christine C. Ferguson
Acting Commissioner

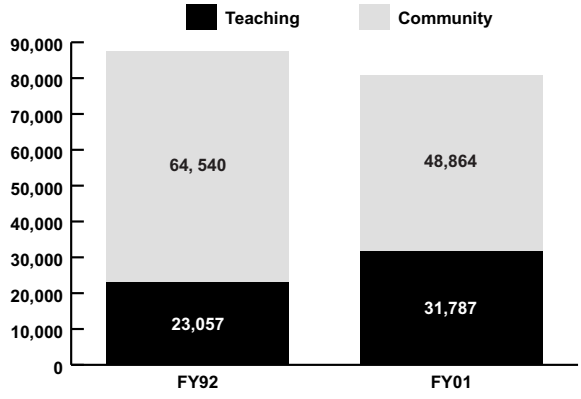
Maternal Outcomes at Massachusetts Hospitals

ANALYSIS IN BRIEF

Number 5
July 2003

National data show that Massachusetts residents are hospitalized in teaching hospitals three times more often per 1,000 population than residents of other states who rely more heavily on community hospitals.[1] Care for comparable conditions is typically more expensive at teaching hospitals than at community hospitals due to overhead expenses inherent in teaching and research functions, and the availability of advanced technology and equipment. In addition, dependence on teaching hospitals in Massachusetts is increasing, and younger patients are migrating to teaching hospitals more rapidly than older patients.[2] In 2001, Massachusetts community hospitals performed 24% fewer deliveries, while teaching hospitals performed 38% more deliveries, than they did in 1992 (see Figure 1). Today many of the women delivering in Boston's six (of the state's eight) teaching hospitals are not Boston residents; in 2000 and 2001, two-thirds came from ZIP Codes outside the city's limits, likely bypassing one or more community hospitals offering maternity services.

Figure 1: Numbers of Deliveries at Community and Teaching Hospitals, FY92 and FY01



Private and public insurers currently place few, if any, limitations on their enrollees' choice of hospital. In the absence of such restriction or widely available data comparing clinical quality, patients often default to the best-known or best-advertised hospital, or one recommended by word of mouth.

This issue of *Analysis in Brief* assesses several clinical outcomes for maternity care associated with routine or low-risk deliveries at community and teaching hospitals in Massachusetts. This information is intended to assist consumers, insurers and public payers who are considering increased use of lower-cost community hospitals for primary and secondary care.

Methodology

The Division of Health Care Finance and Policy (DHCFP) analysis reported here is a modification of a study, reported in *Obstetrics and Gynecology*, which analyzed maternity deliveries in the state of Maryland.[3] This DHCFP analysis used two fiscal years (2000 and 2001) of administrative data from hospital discharge records of women who gave birth at the 49 Massachusetts hospitals that have obstetrics units. The study population was selected using diagnosis-related groups (DRGs) for childbirth generated by the 3M All-Patient Version 12 grouper (DRGs #370-375). High-risk DRGs (#650-652) were excluded from this analysis, however they accounted for only four percent of all Massachusetts deliveries.

For this analysis, a hospital was classified as "teaching" if it sponsors an obstetrics residency or is a major participating institution according to

the Accreditation Council for Graduate Medical Education (ACGME).[4] Teaching hospitals as defined above included: Baystate Medical Center, Beth Israel Deaconess Medical Center, Boston Medical Center, Brigham and Women's Hospital, Massachusetts General Hospital, New England Medical Center, St. Elizabeth's Medical Center of Boston, and University of Massachusetts Memorial Medical Center. All of these hospitals have Level III neonatal intensive care units (NICUs); 30% of the community hospitals in this analysis have Level I nurseries (where they care for healthy newborns), and the other 70% have Level II nurseries (where they care for low-risk or moderately ill newborns).

Several clinical outcome measures were assessed for community and teaching hospitals including primary cesarean section (c-section) rate (deliveries for mothers with no previous c-section delivery); repeat c-section rate (deliveries for mothers with previous c-section delivery); episiotomy rate, laceration rate, and total laceration rate (episiotomy or laceration) based on vaginal deliveries; and complication rate (e.g., anesthetic, cardiac, infective, renal, respiratory, wound, hemorrhage) based on all deliveries. All 15 fields for ICD-9 diagnosis codes (for previous c-section or complications) and procedure codes (for episiotomy or laceration repair) were searched to assess deliveries for these outcomes. For the total laceration rate, a mother who had an episiotomy and also had a laceration repair was counted once.

Multiple logistic regression analysis was used to adjust for the following patient characteristics: age, number of diagnoses, payer source (public or other), race (white or other), and presence of substance abuse (ICD-9 code in any diagnosis field). Analyses were also adjusted by each hospital's volume of deliveries.

Hospital volume for deliveries is based on hospital discharge data reported to the DHCFP for hospital FY01. Volume was coded as a series of dummy variables as follows: 1,000-1,999, 2,000-2,999, 3,000-3,999, 4,000-4,999, 5,000+ with fewer than 1,000 deliveries used as the referent category. In addition, type of delivery (vaginal versus c-section) was included in the analysis of complication rate. All outcomes were expressed as dichotomous variables (i.e., yes/no, present/absent) (see Table 1).

Results

A total of 152,938 records with charges of $200 or more were selected for the two-year analysis. The eight teaching hospitals accounted for 39% of all deliveries with one performing over 9,500 births annually, thereby exerting a heavy influence on statewide rates. Almost 75% of deliveries at teaching hospitals took place at hospitals with 4,000 deliveries or more. The 41 commu-

Table 1: Patient and Hospital Variables by Hospital Type, FY00 and FY01 Annualized

	Teaching Hospital	Community Hospital
Number of Hospitals	8	41
Number of Discharges	29,745 (39%)	46,724 (61%)
Volume of Deliveries		
< 1000	0.0%	28.4%
1001-1999	15.7%	33.4%
2000-2999	0.0%	23.6%
3000-3999	10.1%	14.6%
4000-4999	43.5%	0.0%
5000+	30.6%	0.0%
	100.0%	100.0%
Delivery DRGs		
370: C-section w complications/co-morbidities	4.7%	3.7%
371: C-section w/o complications/co-morbidities	16.1%	18.1%
372: Vaginal w complicating diagnoses	22.8%	18.1%
373: Vaginal w/o complicating diagnoses	53.7%	57.6%
374: Vaginal w sterilization &/or d&c	2.4%	1.9%
375: Vaginal w o.r. proc except steril &/or d&c	0.5%	0.6%
Payer		
public	23.6%	23.3%
other	76.4%	76.7%
Age		
17 and younger	1.2%	0.9%
18-34	75.5%	79.4%
35 and older	23.3%	19.7%
mean age	29.8	29.3
Race		
white	60.6%	79.7%
other	39.5%	20.3%
Number of Diagnoses		
1-3	48.1%	54.8%
4+	51.9%	45.2%
mean diagnoses	4.0	3.7
Substance Abuse Diagnoses		
1+	1.1%	0.6%
0	98.9%	99.4%
Previous C-section	11.2%	12.0%

nity hospitals accounted for 61% of all deliveries with 66% of those occurring at hospitals with fewer than 2,000 deliveries. C-sections accounted for 21% of all deliveries.

Women who gave birth at teaching hospitals were about the same age, on average, as women who gave birth at community hospitals (age 29.8 versus age 29.3). At teaching hospitals, a somewhat higher percent of women were ages 35 and older (23.3% versus 19.7%), and ages 17 and younger (1.2% versus 0.9%). Women who gave birth at teaching hospitals were less likely to be white than were women who gave birth at community hospitals (60.6% versus 79.7%). Almost one-quarter of the deliveries at both types of hospitals were covered by public sources, primarily Medicaid.

Women who gave birth at teaching hospitals had a slightly higher average number of diagnoses than those who gave birth at community hospitals (4.0 versus 3.7), with 51.9% having four or more diagnoses (versus 45.2% at community hospitals). It should be noted, however, that some diagnoses (e.g., previous c-section) do not necessarily imply compromised health condition, but may signal higher risk in delivery. Women who gave birth at teaching hospitals versus community hospitals were somewhat less likely to have had a previous c-section (11.2% versus 12.0%). Finally, substance abuse diagnoses were not common at either type of hospital.

Table 2: Clinical Outcomes by Hospital Type, FY00 and FY01 Annualized

	Teaching Hospital	Community Hospital	Odds Ratio	Confidence Interval (95%)	P<.05
Primary C-section Rate	14.7%	15.2%	0.955	(0.903-1.010)	
Repeat C-section Rate	68.3%	70.7%	0.888	(0.786-1.003)	
Total Laceration Rate for Vaginal Deliveries	69.1%	70.5%	1.014	(0.968-1.062)	
episiotomy rate	15.3%	25.5%	0.350	(0.328-0.373)	*
laceration repair rate	56.2%	47.2%	1.794	(1.717-1.874)	*
Complication Rate	6.2%	5.6%	1.146	(1.059-1.239)	*

Notes: Teaching and community hospital rates are crude. The regression analyses controlled for case mix, demographic characteristics, and hospital volume.

Clinical Outcomes

The crude primary c-section rate and the repeat c-section rate were lower at teaching hospitals. However, after adjusting for potential confounders, the probability of a c-section delivery was not statistically different between the two types of hospitals. Similarly, for vaginal deliveries, the crude total laceration rate (episiotomy or laceration repair) was lower at teaching hospitals, but after adjustment, was not statistically different. The likelihood of having an episiotomy was significantly lower at teaching hospitals after adjustment, but the laceration rate was significantly higher. The crude overall complication rate was higher at teaching hospitals, and remained significantly higher, even after adjustment (see Table 2).

Resource Use

Mean and median lengths of stay were similar for vaginal deliveries at teaching and community hospitals (2.6 and 2.0 versus 2.2 and 2.0 days) and c-section deliveries (4.6 and 4.0 days versus 4.0 days for both). However, mean and median total charges for vaginal deliveries were almost twice as high at teaching hospitals ($7,559 and $6,851) versus community hospitals ($3,912 and $3,578), while mean and median total charges for c-sections were more than 75% higher at teaching hospitals ($11,737 and $10,682) versus community hospitals ($6,552 and $6,110). Although charges are not the same as costs or reimbursement (neither of which is available to DHCFP), there is presumed to be some relationship among the three.

Discussion

Overall, maternal outcomes for the low-risk deliveries assessed were comparable between community and teaching hospitals after controlling for case mix, demographic characteristics, and hospital volume. For such deliveries, the maternity care provided by community hospitals is cost-effective. However, using these results to encourage women anticipating routine deliveries to change the location of their maternity care may not be straightforward for several reasons.

First, this DHCFP study analyzed only maternal, not newborn, outcomes. Second, this analysis used only those outcome measures which are readily available on administrative data files. There are other outcomes not captured by these

Analysis in Brief

Analysis in Brief reflects the goal of the Division of Health Care Finance and Policy to monitor changes in the health care marketplace through useful and timely analyses of health care data. Several times a year, this publication reports on our analyses of health care costs, quality and access.

Mitt Romney
Governor

Kerry Healey
Lieutenant Governor

Ronald Preston
Secretary
Executive Office of
Health and Human Services

Division of Health Care Finance and Policy
2 Boylston Street, Boston, MA 02116
Tel: 617.988.3100
Fax: 617.727.7662
www.mass.gov/dhcfp

Christine C. Ferguson
Acting Commissioner

Staff for this issue:
John Cai
Amy Lischko
Maria Schiff
Maxine Schuster

John Cai, Series Editor
Heather Shannon, Design
Shelley Fortier, Distribution

Analysis in Brief

Division of Health Care Finance and Policy

data that should be considered by pregnant women and clinicians.

Third is the distribution of teaching hospitals in eastern Massachusetts. There are no community hospitals in Boston offering maternity services, rendering that option impractical for women residing in Boston. However, women delivering at Boston teaching hospitals who live outside of Boston outnumber city residents two to one.

Fourth is the relative predictability of a high-risk delivery. While some may argue that it is difficult to identify in advance those women who are likely to have a high-risk delivery, there are factors that can be used to identify many of these individuals. Since level III NICUs are found only in teaching hospitals, some women are referred to these facilities because they are carrying high-risk babies who are expected to need intensive medical attention from birth.

The urgency for cost containment and efficiency is pressuring hospitals, payers, and increasingly, consumers. A recent report by the Task Force on Academic Medical Centers recommended that the leading teaching hospitals will need to provide evidence that the care received at their institutions is worth the extra cost.[5,6] This analysis suggests that most women can safely and confidently use cost-efficient community hospitals for childbirth.

Yet it is clear that still more information is needed to help women make informed decisions about maternity care, especially with regard to newborn outcomes. If and when consumers are asked to pay more for choosing more expensive sites of care, they will lend their voice to the demand for more comprehensive and widely available data. Some useful data are already available on the Division of Health Care Finance and Policy web site,[7] including profiles of the maternity practices of the 49 maternity hospitals and three birth centers currently licensed by the Commonwealth of Massachusetts.

---

1. E. Moskovitch, "A Study on the Condition of Massachusetts Community Hospitals," Massachusetts Council of Community Hospitals, 2000.
2. Division of Health Care Finance and Policy, *Healthpoint*, April 2001.
3. F. Garcia et al, "Effect of academic affiliation and obstetric volume on clinical outcome and cost of childbirth," *Obstetrics and Gynecology*, 2001; 97(4): 567-576.
4. Accreditation Council for Graduate Medical Education available at www.acgme.org/adspublic/.
5. L. Kowalczyk, "Changes urged for teaching hospitals," *The Boston Globe*, February 5, 2003.
6. "Envisioning the future of academic medical centers," New York: Commonwealth Fund, February, 2003.
7. Division of Health Care Finance and Policy web site: www.mass.gov/dhcfp.